

What is claimed is:

1. A personal verification device comprising:

a first detection section which detects characteristic information of an operator;

5 a second detection section which detects a pulse wave of the operator;

an index extraction section which extracts at least one index by processing the pulse wave detected by the second detection section;

a first storage section which stores first reference information which is compared with the characteristic information;

10 a second storage section which stores second reference information which is compared with the at least one index; and

a verification section which outputs a signal indicating that the operator is true when the operator is determined to be the same person as a registered person based on the result of comparison between the characteristic information and the first reference information, and also to be alive based on the result of comparison between the at least
15 one index and the second reference information.

2. The personal verification device as defined in claim 1,

wherein the index extraction section includes a wave height extraction section
20 which extracts as the at least one index a wave height of at least one of a plurality of inflection points in the pulse wave detected by the second detection section.

3. The personal verification device as defined in claim 1,

wherein the index extraction section includes a time extraction section which
25 extracts as the at least one index the time until occurrence of at least one of a plurality of inflection points in the pulse wave detected by the second detection section.

4. The personal verification device as defined in claim 1,
wherein the index extraction section includes a wave height ratio extraction
section which extracts as the at least one index the wave height ratio of a plurality of
inflection points in the pulse wave detected by the second detection section.

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5. The personal verification device as defined in claim 1,
wherein the index extraction section includes:
a calculation section which calculates an acceleration waveform of the pulse
wave detected by the second detection section; and

10 a wave height ratio extraction section which extracts as the at least one index a
wave height ratio of a plurality of inflection points in the acceleration waveform.

6. The personal verification device as defined in claim 1,
wherein the index extraction section includes a time ratio extraction section
15 which extracts as the at least one index the time ratio of a plurality of inflection points
in the pulse wave detected by the second detection section.

7. The personal verification device as defined in claim 6,
wherein the time ratio extraction section extracts a ratio of a cycle and an
20 ejection time of the pulse wave detected by the second detection section from the pulse
wave.

8. The personal verification device as defined in claim 1,
wherein the index extraction section is an amplifier which amplifies the pulse
25 wave detected by the second detection section, the amplifier extracting as the at least
one index an amplification ratio when amplifying the pulse wave into a signal having an
amplitude larger than a predetermined amplitude by using an auto gain control function.

9. The personal verification device as defined in claim 1, further comprising:
a historical information storage section which stores historical information on
the at least one index extracted by the index extraction section; and
5 an information update section which updates the second reference information
in the second storage section based on the historical information.

10. The personal verification device as defined in claim 1, wherein:
the characteristic information is a fingerprint;
10 the first detection section is a fingerprint sensor; and
fingerprint information of the registered person is stored in the first storage
section.

11. The personal verification device as defined in claim 10,
15 wherein the fingerprint sensor detects a fingerprint by detecting capacitance
which changes corresponding to ridges and valleys on a surface of a fingertip of the
operator.

12. The personal verification device as defined in claim 11,
20 wherein the fingerprint sensor includes M (M is an integer equal to or larger
than two) rows of power supply lines, N (N is an integer equal to or larger than two)
columns of output lines, and $M \times N$ capacitance detection elements respectively
provided at intersections of the M rows of power supply lines and the N columns of
output lines.

25 13. The personal verification device as defined in claim 12, wherein:
each of the $M \times N$ capacitance detection elements includes a signal detection

element and a signal amplification element;

the signal detection element includes a capacitance detection electrode and a capacitance detection dielectric film; and

the signal amplification element is a thin film MIS semiconductor device for
5 signal amplification which includes a gate electrode, a gate insulating film, and a semiconductor film.

14. The personal verification device as defined in claim 13, wherein:

the fingerprint sensor further includes a power supply select circuit connected
10 to the M rows of power supply lines; and

the power supply select circuit has M power supply pass gates provided between a common power supply line and the M rows of power supply lines, each of the M power supply pass gates being the thin film MIS semiconductor device for a signal amplification which includes a gate electrode, a gate insulating film, and a
15 semiconductor film.

15. The personal verification device as defined in claim 13, wherein:

the fingerprint sensor further includes a signal select circuit connected to the N columns of output lines; and

the signal select circuit has N output signal pass gates provided between a common output line and the N columns of output lines, each of the N output signal pass gates being the thin film MIS semiconductor device for a signal amplification which includes a the thin film MIS semiconductor device for a signal amplification gate electrode, a gate insulating film, and a semiconductor film.

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16. The personal verification device as defined in claim 12, further comprising:

a start switch which activates the personal verification device when the

fingerprint sensor detects a touch of a finger.

17. The personal verification device as defined in claim 1,

wherein the second detection section includes a pulse wave sensor having a
5 light emitting element and a light receiving element, and optically detecting the pulse
wave of the operator.

18. The personal verification device as defined in claim 10, wherein:

the second detection section includes a pulse wave sensor having a light
10 emitting element and a light receiving element; and

the fingerprint sensor is provided on a top surface of the pulse wave sensor, and
part of the fingerprint sensor intersecting the path of the light emitted by the light
emitting element or received by the light receiving element being formed of a material
transparent to the wavelength of the light emitted by the light emitting element.

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19. The personal verification device as defined in claim 18,

wherein the pulse wave sensor is forbidden to detect a pulse wave when a
fingerprint detected by the fingerprint sensor has been determined to be false by the
verification section.

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20. The personal verification device as defined in claim 17, further comprising:

a low-cut filter which cuts out a low frequency component from the pulse wave
detected by the pulse wave sensor.

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21. The personal verification device as defined in claim 20,

wherein the low-cut filter cuts out a low frequency in a range from 0.4 to 0.5
Hz.

22. A card-type information storage medium comprising the personal verification device as defined in claim 1.

5 23. The card-type information storage medium as defined in claim 22, further comprising:

a display section which displays notification that the card-type information storage medium is in an available state, based on the signal from the verification section.

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24. An information processing system comprising:

the card-type information storage medium as defined in claim 22; and

an information processing device which performs processing based on information in the card-type information storage medium,

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wherein the information processing device reads information other than the information used for personal verification from the card-type information storage medium, after the signal is input from the verification section.

25. The information processing system as defined in claim 24,

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wherein the information processing device has a power supply section which supplies power to the card-type information storage medium.

26. A personal verification device comprising:

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a detection section which detects an operator's biological information which changes with time;

a first storage section which stores reference information which is compared with the biological information;

a second storage section which stores historical information on the biological information detected by the detection section;

an update section which updates the reference information in the first storage section, based on the historical information in the second storage section; and

5 a verification section which outputs a signal indicating that the operator is true, based on the result of comparison between the biological information and the reference information.

27. A card-type information storage medium comprising the personal verification
10 device as defined in claim 26.

28. A card-type information storage medium comprising the personal verification device as defined in claim 18,

wherein a second thin film device having at least the fingerprint sensor is
15 provided on a top surface of a first thin film device having at least the pulse wave sensor.

29. The card-type information storage medium as defined in claim 28, further comprising:

20 a display section which displays notification that the card-type information storage medium is in an available state, based on the signal from the verification section.

30. An information processing system comprising:

25 the card-type information storage medium as defined in claim 29; and

an information processing device which performs processing based on information in the card-type information storage medium,

wherein the information processing device reads information other than the information used for personal verification from the card-type information storage medium, after the signal is input from the verification section.

- 5 31. The information processing system as defined in claim 30,
 wherein the information processing device includes a power supply section
 which supplies power to the card-type information storage medium.